

Work Center ID 51082

July 30, 2009 10:27:20 AM



Page 1

Item ID: D212-664-107

Accept



Setup Start



Revision ID: A

Stop



Item Name: Crosstube Low Standard Fwd

Start Date: 08/03/2009 Start Qty: 1.00



Cust Item ID:

Required Date: 08/21/2009 Req'd Qty: 1.00

Customer:

Reference:

Approvals: Process Plan: *mf*

Date: *09-07-30* Tooling:

Date:

Run Start



QC:

Date:

SPC (Y/N):

Date:

Stop



Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Draw Number	Draw Rev.	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
Draw Nbr	Revision Nbr								
D212-664-147	Rev A								

100

0.00



DC

Document Control

DOCUMENT CONTROL

Memo

Photocopy bluefile and create labels as per PPP D212-664-107 CHG001

9/8/20 09/08/20 502/08/20

110

0.00



Packaging

Packaging

Packaging

Memo

0.00

9/8/20 9/8/20

120

0.00



CNC Bend 2

CNC Alpha 160 Bender

BENDING MACHINE - CROSSTUBES

Memo

Bend tube as per Dwg D412-664-243 using CNC bender program 412-af and Folio FT010

9-8-17

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

Work Order ID 51082

July 30, 2009 10:27:20 AM



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Item ID: D212-664-107

Accept



Setup Start



Revision ID: A

Stop



Item Name: Crosstube Low Standard Fwd

Start Date: 08/03/2009 Start Qty: 1.00



Cust Item ID:

Required Date: 08/21/2009 Req'd Qty: 1.00



Customer:

Reference:

Approvals: Process Plan: _____ Date: _____ Tooling: _____ Date: _____
QC: _____ Date: _____ SPC (Y/N): _____ Date: _____

Run Start



Stop



Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Draw Number	Draw Rev.	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
130	QC15- Crosstube Dimensional Check	0.00							
QC	Memo	0.00							
Quality Control									
140	Crosstubes	0.00							
Crosstubes	Memo	0.00							
Crosstubes	1-Drill Rivet holes as per Dwg D212-664-147 using DT8972. □2-Drill pilot holes in tube as per Dwg D212-664-147 □3-Ream hole to finish size in tube as per Dwg D212-664-147 □4-Deburr & Inspect for surface damage. Repair damage within limits as per Dwg D212-6								
150	Crosstubes Chemical Conversion	0.00							
HandFXtube	Memo	0.00							
Hand Finishing Crosstubes									

2) 509/08/17

ⓧ

ⓧ

DP 9-8-17
-AWM 9-8-17






870

1 ⓧ - AWM 9-8-18

Dart Aerospace Ltd

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: D212-664-107 PAR #: N/A Fault Category: Closures NCR: Yes No DQA: Date: 09.08.28
 Resolution: Accepted Disposition: Use as is QA: N/C Closed: Date: 09.08.28

NCR: <u>51082</u>		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			
09.08.17	140	Upon drilling <u>deburring</u> the #30 holes, 1 hole on the flap section was slightly c/sunk 0.030" on the surface of a 0.140" wall. Debur Deburring tool blade jammed out; did not spring in due to some debris. R.C. Tooling.	 09.08.17 PC- QSI 042	CUFF SUFFICIENTLY STRUNG WITH CSK RIVET HALF. SEE ATTACHED ANALYSIS	 9/8/17	 09/08/17	 09.08.17 PC- QSI 042	 09/08/17

NOTE: Date & initial all entries

Work Order ID 51082

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Item ID: D212-664-107

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Revision ID: A

Stop



Item Name: Crosstube Low Standard Fwd

Start Date: 08/03/2009 Start Qty: 1.00



Cust Item ID:

Required Date: 08/21/2009 Req'd Qty: 1.00



Customer:

Reference:

Run Start



Approvals: Process Plan: _____ Date: _____ Tooling: _____ Date: _____

Stop



QC: _____ Date: _____ SPC (Y/N): _____ Date: _____

Sequence ID/
Work Center IDOperation
DescriptionSet Up/
Run HoursDraw
NumberDraw
Rev.Plan
CodeAccept
QtyReject
QtyReject
NumberInsp.
Stamp

160



QC

Quality Control

QC3- Inspect Part Finish

0.00

Memo

0.00

2) 5 08/08/18

40

p

170



QC

Quality Control

QC5- Inspect part completeness to step on W/O

0.00

Memo

0.00

3) 8 08/08/18

40

p

180



Outsource2

Outsource process - NDT

Outsource process - NDT per QSI038 4.1

0.00

Memo

0.00

Liquid Penetrant Inspection as per QSI 038 Or ☐ Issue P/O: 10320 LPI as per ASTM 1417 ☐ Level 2 Attach copy of NDT results to work order

CL 09/08/19 ①

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

Work Order ID 51082

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Item ID: D212-664-107

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Stop



Item Name: Crosstube Low Standard Fwd

Start Date: 08/03/2009 Start Qty: 1.00



Cust Item ID:

Required Date: 08/21/2009 Req'd Qty: 1.00



Customer:

Reference:

Run Start



Approvals: Process Plan: _____ Date: _____ Tooling: _____ Date: _____

Stop



QC: _____ Date: _____ SPC (Y/N): _____ Date: _____

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Draw Number	Draw Rev.	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
--------------------------------	--------------------------	----------------------	----------------	--------------	--------------	---------------	---------------	------------------	----------------

190

0.00



Packaging

Packaging

Memo

0.00

Packaging

Ensure copy of NDT results attached to work order.

10/15/18

①

200

QC5- Inspect part completeness to step on W/O

0.00



QC

Memo

0.00

Quality Control

Inspect for damage & ensure results are as per Dwg D412-664-203

10/15/18

09

08

19

①

210

0.00



Crosstubes

Crosstubes

Memo

0.00

Crosstubes

1-Rivet Cuffs as per Dwg D212-664-147. with Sika flex in Between tube &
Cuff 11A/R SIKAFLEX -241/-291 BATCH: 112391

10/15/18

09

08

19

①

Dart Aerospace Ltd

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

Work Order ID 51082

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Item ID: D212-664-107

Accept



Setup Start



Revision ID: A

Stop



Item Name: Crosstube Low Standard Fwd

Start Date: 08/03/2009 Start Qty: 1.00



Cust Item ID:

Required Date: 08/21/2009 Req'd Qty: 1.00

Customer:

Reference:

Run Start



Approvals: Process Plan: _____ Date: _____ Tooling: _____ Date: _____

Stop



QC: _____ Date: _____ SPC (Y/N): _____ Date: _____

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Draw Number	Draw Rev.	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
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220

0.00



SprayPaint

SprayPaint

Memo

0.00

Spray Painting

1-Prime inside and outside crosstube as per QSI 005 4.2 ☐ 2-Paint outside crosstube with White Imron as per QSI 005 4.2 ☐ PRIME: ☐ Start Time: 10:00 ☐ Finish Time: 11:30 ☐ PAINT: ☐ Start Time: 3:00 ☐ Finish Time: 4:00

RT 09-08-19
RT 09-08-24

230

0.00



QC14- Inspect Spray Paint

QC

Memo

0.00

Quality Control

Wrap in plastic bag to protect from scratches

09-08-25
09-08-20 (1)

240

0.00



Crosstubes

Crosstubes

Memo

0.00

Crosstubes

1- Assemble as per Dwg D212-664-147 ☐ 2- Lightly scuff the bonded area using a 320 grit sand paper and clean the area with 41058 wash 'n' wipe ☐ 3- Instal support with magnobond 6398 per dwg D212-664-147, ☐ cure for 12hrs before packaging. ☐ Time & date of applic

RT 09-08-20
RT 09-08-25

11:00
M 111249
exp 10-08-01

PTO →

Dart Aerospace Ltd

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: D212-664-107 PAR #: N/A Fault Category: close NCR: (Yes) No DQA: AA Date: 09.08.28
 Resolution: re-work Disposition: re-work QA: N/C Closed: _____ Date: _____

NCR: <u>51082</u>		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			
9/6/24	210	During inspection it was found that the supports were installed incorrectly. The measurement of the supports should be 28.00" but they are at 27.375"		Remove both supports and remove the magnet from both x-tube and supports	BT 09-08-24			
				Re Assemble as per DWG D212-664-147	BT 09-08-25			
		The employee was under the understanding that they were 210's due to a DSO that was attached to R.C. Human error. LOA to dwg detail.		magnet B 11249 exp 08-1		02/06/26		
				Scuff center arm lightly and mark off the arm not to be repaired	BT 09-08-24			
				Re paint as per QST 005				
				W/inspect supports as necessary	BT 09-08-24	02/06/26		
				See W/O 51080 for additional memo info for clarification.				

NOTE: Date & initial all entries

Work Order ID 51082

July 30, 2009 10:27:20 AM



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Item ID: D212-664-107

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Setup Start



Revision ID: A

Stop



Item Name: Crosstube Low Standard Fwd

Start Date: 08/03/2009 Start Qty: 1.00



Cust Item ID:

Required Date: 08/21/2009 Req'd Qty: 1.00

Customer:

Reference:

Run Start



Approvals: Process Plan: _____ Date: _____ Tooling: _____ Date: _____

Stop



QC: _____ Date: _____ SPC (Y/N): _____ Date: _____

Sequence ID/
Work Center ID

Operation
Description

Set Up/
Run Hours

Draw
Number

Draw
Rev.

Plan
Code

Accept
Qty

Reject
Qty

Reject
Number

Insp.
Stamp

250

QC5- Inspect part completeness to step on W/O

0.00



QC

Memo

0.00

=> S 08/08/26

(46)

/

Quality Control

260

QC4- 100% Inspect kits for completeness

0.00



QC

Memo

0.00

=> S 08/08/26

(46)

/

Quality Control

270

Packaging

0.00



Packaging

Memo

0.00

Identify and pack for shipping as per PPP D212.664-107

A 08/14/26 (1)

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

Work Order ID 51082

July 30, 2009 10:27:20 AM



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Item ID: D212-664-107

Accept



Setup Start



Revision ID: A

Stop



Item Name: Crosstube Low Standard Fwd

Start Date: 08/03/2009 Start Qty: 1.00



Cust Item ID:

Required Date: 08/21/2009 Req'd Qty: 1.00



Customer:

Reference:

Approvals: Process Plan: _____ Date: _____ Tooling: _____ Date: _____

Run Start



QC: _____ Date: _____ SPC (Y/N): _____ Date: _____

Stop

Sequence ID/
Work Center IDOperation
DescriptionSet Up/
Run HoursDraw
NumberDraw
Rev.Plan
CodeAccept
QtyReject
QtyReject
NumberInsp.
Stamp

280

QC4- 100% Inspect kits for completeness

0.00



QC

Memo

N/A

0.00

Quality Control

Set 08/05/26

th

0

290

QC21- Final Inspection - Work Order Release

0.00



QC

Memo

0.00

Quality Control

09/08/27

BP 09-8-26

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

Picklist Print

Page 1

July'30, 2009 10:27:19 AM

Work Order ID: 51082

Parent Item: D212-664-107RevA

Parent Item Name: Crosstube Low Standard Fwd

Comments:

Start Date: 08/03/2009

Required Date: 08/21/2009

Start Qty: 1.00

Required Qty: 1.00

Component Item ID/ Item Name	Replacement Item ID	Mfg/ Purch	Bin Item	Primary Location	Last Location	Route Seq ID	Unit of Measure	Qty on Hand	Remaining Qty To Pick	Qty Issued	Date Issued	Status
---------------------------------	------------------------	---------------	-------------	---------------------	------------------	-----------------	--------------------	----------------	--------------------------	---------------	----------------	--------

D3428-1RevA

Manufactured

No

100

Each

56.0000

1.0000



Placard

Warehouse
Location

Loc Qty

Loc Code

Main Warehouse

ST

16

47310

6

48359

10

Main Warehouse

ST096

40

50790

40

D212-664-

107TRNRevA

Manufactured

No

140

Each

0.0000

1.0000



Crosstube Turning Detail

D3659-1RevB

Manufactured

No

220

Each

8.0000

2.0000



CUFF

Warehouse
Location

Loc Qty

Loc Code

Main Warehouse

ST

8

37426

8

B50790 SP
9/8/20 @

B50704 DP 9-8-17

B51153 DP 9-8-17

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

Picklist Print

July 30, 2009 10:27:19 AM

Work Order ID: 51082

Parent Item: D212-664-107RevA

Parent Item Name: Crosstube Low Standard Fwd


Start Date: 08/03/2009

Required Date: 08/21/2009

Comments:

Start Qty: 1.00

Required Qty: 1.00

Component Item ID/ Item Name	Replacement Item ID	Mfg/ Purch	Bin Item	Primary Location	Last Location	Route Seq ID	Unit of Measure	Qty on Hand	Remaining Qty To Pick	Qty Issued	Date Issued	Status
CR3212-4-06  CHERRY RIVET		Purchased	No			240	Each	346.0000	44.0000			

85 09-08-09

M112314 (44x)

<u>Warehouse</u>	<u>Loc Qty</u>	<u>Loc Code</u>
<u>Location</u>		
Main Warehouse		
ST	346	
107534	346	

D2893-1RevB

Manufactured No

240

Each

72.0000

2.0000

2.75 Support

<u>Warehouse</u>	<u>Loc Qty</u>	<u>Loc Code</u>
<u>Location</u>		
Main Warehouse		
ST	72	
25657	6	
43479	10	
46488	18	
47109	18	
47637	20	

85 09-08-20

x2

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

Picklist Print

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July 30, 2009 10:27:19 AM

Work Order ID: 51082



Parent Item: D212-664-107RevA



Parent Item Name: Crosstube Low Standard Fwd

Start Date: 08/03/2009

Required Date: 08/21/2009

Comments:

Start Qty: 1.00

Required Qty: 1.00

Component Item ID/ Item Name	Replacement Item ID	Mfg/ Purch	Bin Item	Primary Location	Last Location	Route Seq ID	Unit of Measure	Qty on Hand	Remaining Qty To Pick	Qty Issued	Date Issued	Status
D3595-063-450RevA		Manufactured	No			240	Each	47.8000	4.0000			
RUBBER CUSHION												

Warehouse Loc Qty Loc Code
Location

25 09-08-20

Main Warehouse

ST	47.8
38959	2
43210	4.8
46465	41

x4

AN6-35A

Purchased

No

260

Each

134.0000

4.0000



BOLT



M111650

Warehouse Loc Qty Loc Code
Location

Main Warehouse

ST	134
111605	34
112314	100

54

9/8/25 12

July 30, 2009 10:27:19 AM

Shop Packet Print

Page 3

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
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			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

Picklist Print

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Work Order ID: 51082

Parent Item: D212-664-107RevA

Parent Item Name: Crosstube Low Standard Fwd


Start Date: 08/03/2009

Required Date: 08/21/2009

Comments:

Start Qty: 1.00

Required Qty: 1.00

Component Item ID/ Item Name	Replacement Item ID	Mfg/ Purch	Bin Item	Primary Location	Last Location	Route Seq ID	Unit of Measure	Qty on Hand	Remaining Qty To Pick	Qty Issued	Date Issued	Status
AN6-36A  Bolt		Purchased	No			260	Each	169.0000	4.0000			

M 111650 50

Warehouse
Location

Main Warehouse

Loc	Qty
ST	169
109632	1
110382	18
111650	50
112314	100

AN960JD616



Washer

Purchased

No

260

Each

1,326.000 18.0000

M 112314 5

Warehouse
Location

Main Warehouse

Loc	Qty
ST	1326
107242	3
107959	6
109371	8
110704	23
111193	18
111607	268
112314	1000

50

9/8/26 10

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
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Work Order ID: 51082

Parent Item: D212-664-107RevA

Parent Item Name: Crosstube Low Standard Fwd



Start Date: 08/03/2009

Required Date: 08/21/2009

Comments:

Start Qty: 1.00

Required Qty: 1.00

Component Item ID/ Item Name	Replacement Item ID	Mfg/ Purch	Bin Item	Primary Location	Last Location	Route Seq ID	Unit of Measure	Qty on Hand	Remaining Qty To Pick	Qty Issued	Date Issued	Status
MS21042L6  Nut		Purchased	No			260	Each	755.0000	6.0000 			

M110002
9/8/26
①②

Warehouse
Location

Loc Qty

Loc Code

Main Warehouse

ST	755	
105077	22	
110002	233	
111548	100	
111578	400	

MS21920-25

Purchased

No

260

Each

156.0000

4.0000


Clamp(per MIL-DTL-8783C)

Warehouse

Loc Qty

Loc Code

Location

Main Warehouse

ST	156	
107456	2	
108111	3	
108975	17	
109181	48	
109644	10	
111282	50	
111429	25	
111883	1	

IT 09-08-20

X4

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

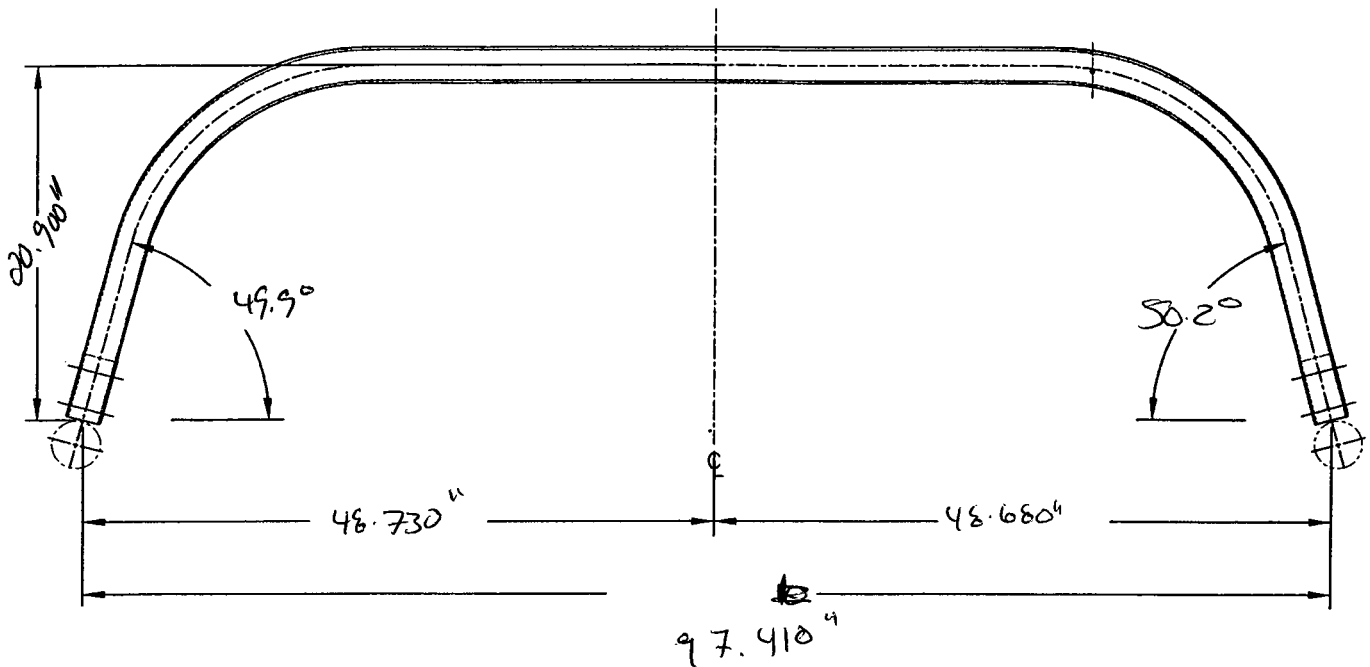
Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

DART AEROSPACE LTD		Work Order: 51082
Description: Crosstube Low Fwd (205/212/412)		Part Number: D212-664-107
Inspection Dwg: D212-664-147 Rev: A		Page 1 of 1

Required Dimension	Min	Max
Height	20.79	21.05
1/2 Span	48.55	48.81
Angle	49	52
Total Span	97.1	97.62



Comments

QC15 Inspection	S
Date	08/02/17

51082
2mf
09-07-30

Rev	Date	Change	Revised by	Approved
A	08.02.29	New Issue	KJ/JM	

PARTS LIST:

Qty	Part Number	Description
X	D212-664-147	CROSSTUBE ASSEMBLY (205/212/412 LOW FWD)
1	D6019-128	CROSSTUBE
2	D2893-1	SUPPORT
4	D3595-063-450	RUBBER CUSHION
2	D3659-1	CUFF
4	MS21920-25	CLAMP (OR MS21920-26)
44	CR3212-4-06	RIVET (OR M7885/3-4-06)
A/R	MAGNOBOND 6398	ROCKWELL SPECIFICATION RBO-120-023 ADHESIVE (TEXTRON/BELL SPEC. 299-947-100, TYPE II, CLASS 2 ADHESIVE)
A/R	SIKAFLEX-241/-291	SEALANT (OR PROSEAL 890 OR MIL-S-8802 CLASS B2 SEALANT)

GENERAL NOTES:

- 1) MATERIAL: MANUFACTURED FROM D6019-128
FINISHED LENGTH = 126.53±0.020 (BEFORE BENDING/TRIMMING)
- 2) FINISH: CHEMICAL CONVERSION COAT PER DART QSI 005 4.1
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2
PAINT OUTSIDE PER DART 005 4.2
- 3) TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED.
- 4) ALL DIMENSIONS ARE IN INCHES
- 5) PART IS SYMMETRIC ABOUT CENTERLINE.
- 6) WHEN MACHINING TAPER, RUN-OFF PART AT STOCK. BLEND OUT EDGE LONGITUDINALLY,
TRANSITION SHOULD BE SMOOTH.
- 7) BEND PROGRESSIVELY WITH A MINIMUM OF 8 PASSES. MAXIMUM TUBE FLATTENING DUE
TO BENDING IS 6% BASED ON O.D., EXCEPT UP TO 10% IS ALLOWED IN AREA NOTED.
- 8) LIQUID PENETRANT INSPECT OUTSIDE SURFACE OF CROSSTUBE PER QSI 038.
- 9) SCRIBE DART PART NUMBER AND BATCH NUMBER ON INNER SURFACE OF TUBE WITH A
VIBRATING STYLUS.
- 10) EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE
OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS
SCRATCHES, NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT
LONGITUDINALLY. CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE.
- 11) APPLY A 0.03" TO 0.06" THICK LAYER OF MAGNOBOND 6398 TO THE SURFACE OF D2893-1
THAT WILL BE IN CONTACT WITH THE CROSSTUBE. LET CURE FOR 12 HOURS AFTER
INSTALLATION AND PRIOR TO PACKAGING.
- 12) INSTALL MS21920-25 CLAMPS (OR -26) WITH D3595-063-450 RUBBER CUSHIONS TO SECURE
D2893-1 SUPPORT ON TOP SIDE OF THE CROSSTUBE. ENSURE CLAMPS ARE OPPOSITE
CROSSTUBE SUPPORT.
- 13) TORQUE CLAMPS 80 TO 100 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY
AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING.
- 14) INSTALL D3659-1 CUFF AFTER CHEMICAL CONVERSION COAT BUT BEFORE PAINT, WITH A
LAYER OF SIKAFLEX-241/-291 OR PROSEAL 890 OR MIL-S-8802 CLASS B2 SEALANT BETWEEN
CUFF AND CROSSTUBE. SEAL EDGE OF CUFF TO ENSURE NO GAPS.
- 15) TOUCH-UP HOLES WITH CHEMICAL CONVERSION COAT.

51082

DEO ATTACHED

RELEASED
07.09.24

A		07.07.07	NEW ISSUE	
DESIGN <i>qp</i>		DRAWN BY <i>qp</i>		DART DART AEROSPACE LTD. WARRICKSBURY, OXFORD, ENGLAND
CHECKED <i>qp</i>		APPROVED <i>qp</i>		
DATE 07.07.07		DRAWING NO. D212-664-147		REV. A SHEET 1 OF 3
THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSE OR COPIED OR COMMUNICATED TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD.		TITLE CROSSTUBE (205/212/412 LOW FWD) NTS		SCALE

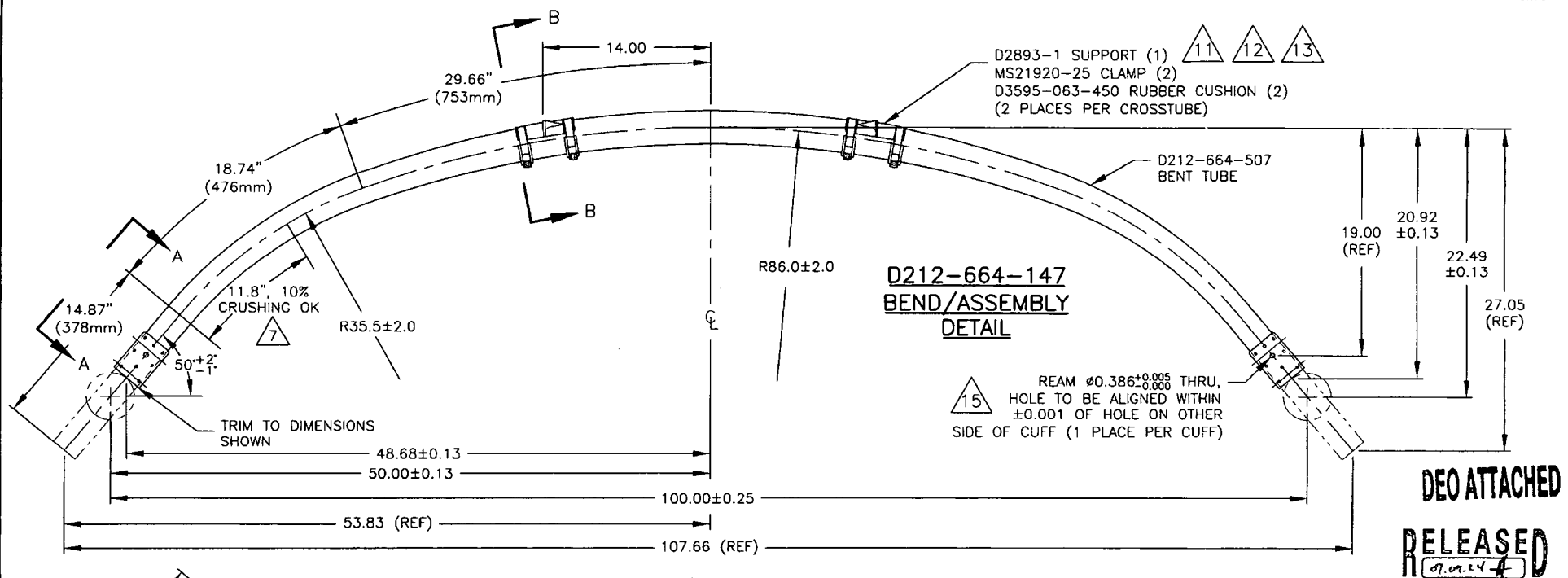
W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

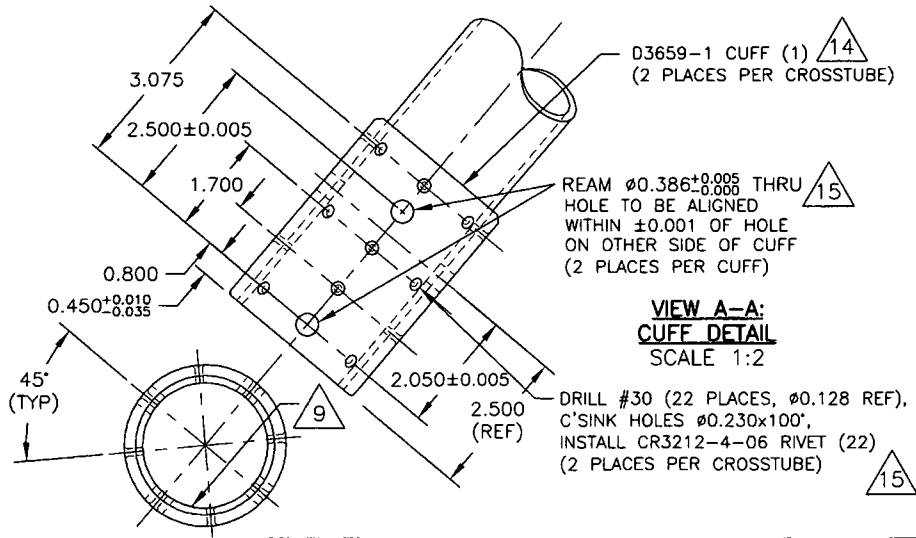
Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

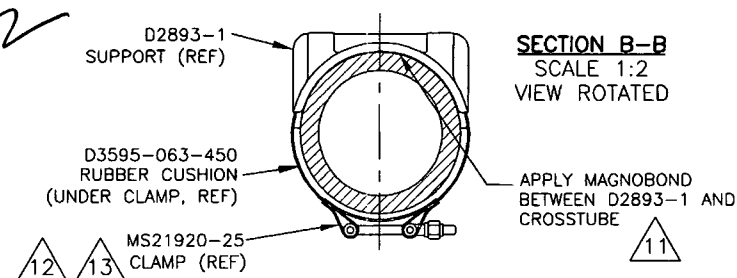
NOTE: Date & initial all entries



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RELEASED
07.07.07



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DATE 07.07.07		TITLE CROSSTUBE (205/212/412 LOW FWD)		SCALE 1:8	

Dart Aerospace Ltd

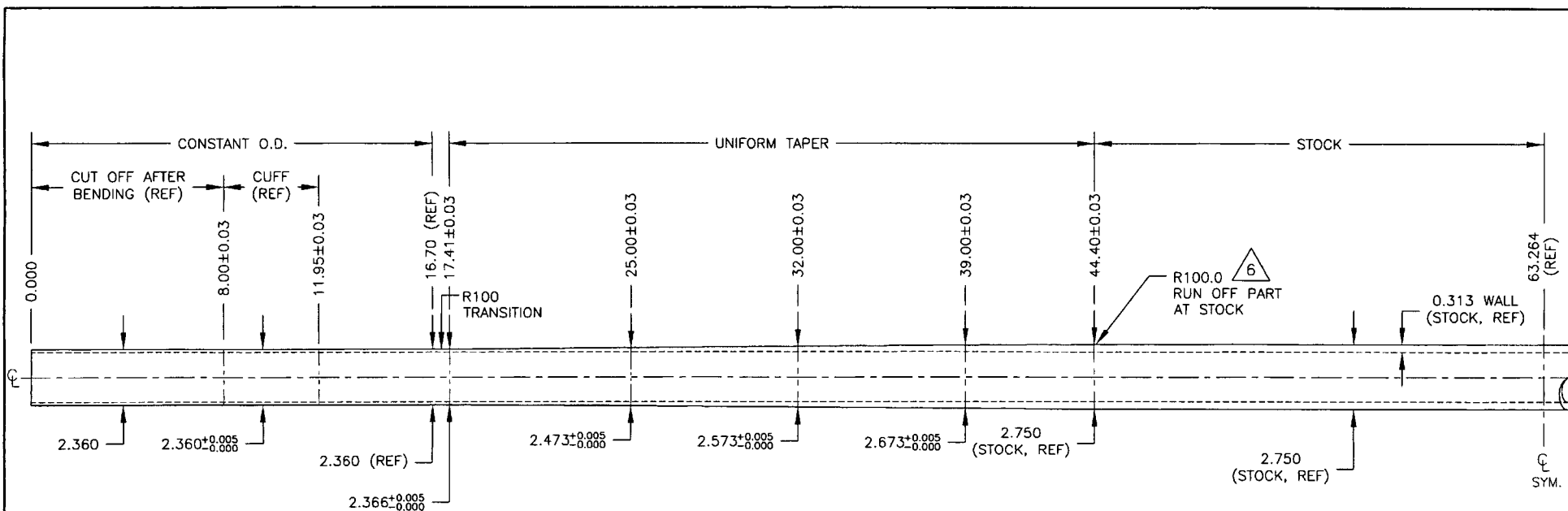
W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries



D212-664-147 MACHINING DETAIL

RELEASED
07.07.24

DEO ATTACHED

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DATE 07.07.07		TITLE CROSSTUBE (205/212/412 LOW FWD)		SCALE 1:4	

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

DRAWING NO. D212-664-147	TITLE CROSSTUBE	REV. A	DART AEROSPACE LTD ENGINEERING ORDER		D.E.O. NO. D212-664-147-A-1	SHEET NO. SHEET 1 OF 1	SCALE NTS
DRAWN <i>JP</i>	CHECKED <i>pt</i>	MFG. APPR. <i>E</i>	APPROVED <i>MD</i>		DE APPR. <i>SH</i>		
DATE 09.05.01	DATE 09.06.15	DATE 09.06.15	DATE 09/06/16		DATE 09/06/16		

CHANGE:

ADD THE FOLLOWING CROSSTUBE ASSEMBLY:

Part Number	Description
D212-664-147B	CROSSTUBE ASSEMBLY (214 LOW FWD)

THE D212-664-147B CROSSTUBE HAS THE SAME PARTS LIST AS THE D212-664-147 CROSSTUBE. HOWEVER, INSTALL THE SUPPORTS AS SHOWN IN FIGURE 1 OF THIS ENGINEERING ORDER. THE NEW KIT IS OTHERWISE ASSEMBLED PER THE D212-664-147 CROSSTUBE.

RELEASED
09/06/22 *MD*

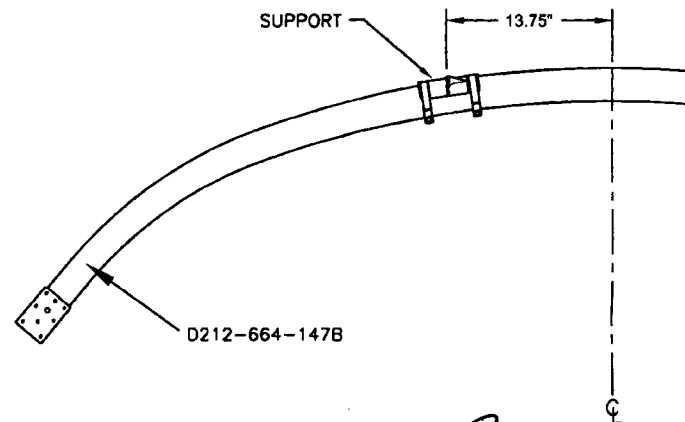


FIGURE 1 - SUPPORT INSTALLATION

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

6.0 D412-664-205 CUFF ANALYSIS

The D412-664-205 aft crosstube has a riveted-on D3606-1 Cuff. This feature will be analysed to the ultimate loads experienced during the drop test completed per TP-D412-664-5 Rev.A. The analysis will consider a crosstube attached to a Dart skidtube with qty(2) AN6 bolts per cuff.

Bearing on AN6 bolt holes

$$F = 18154 \text{ lb}$$

Force on crosstube during drop test, per TP-D412-664-7 Rev.A.

$$w = 0.181 \text{ in}$$

Thickness of crosstube material at cuff, per dwg D412-664-245 Rev.B

$$A_b = 0.375 * 0.181$$

$$= 0.068 \text{ in}^2 \text{ Bearing area for one AN6 hole}$$

$$F_b = (F / 8) / A_b$$

$$= (18154 / 8) / 0.068$$

$$= 33430 \text{ psi} \quad \text{Bearing stress on one bolt hole}$$

$$MS = F_{bru} / F_b - 1$$

$$= 123 \text{ ksi} / 33.4 \text{ ksi} - 1$$

$$= 2.68$$

Margin of Safety

*TO BE CONSERVATIVE, ASSUME CSK HOLE TAKES NO LOAD.
RIVET SHEAR W/ 1 LESS RIVET PER CUFF*

Margin is positive; therefore crosstube material is strong enough to take bearing load without the riveted-on cuff. The wall thickness of the D3606-1 cuff is 0.184" and it is also manufactured the same 7075-T6, so the bearing strength of the riveted-on cuff is sufficiently strong by comparison.

Shear on cuff rivets

The D3606-1 Cuffs are riveted onto the crosstube using qty(22) CR3212-4 rivets per cuff.

$$S_r = 664 \text{ lb}$$

Shear strength of CR3212 rivet per Reference 1, Page 4

$$MS = 44 * S_r / F - 1$$

$$= 44 * 664 / 18154 - 1$$

$$= 0.61$$

Margin of Safety

MARGIN POSITIVE 0.61 RIVET HOLE CSK OK

Margin is positive; therefore rivets are strong enough to transfer any load in the riveted-on cuff into the crosstube. The bearing strength of the rivet holes is sufficiently strong by simple comparison of the fact that qty(44) 0.125" diam. holes are stronger in bearing than qty(8) 0.375" diam. holes.

05.08.17

7.0 CONCLUSION

The fatigue life of the D412-664-105 fwd crosstube and D412-665-205 aft crosstube is 105570 and 27361 cycles respectively. The "on-condition" replacement criteria with frequent inspection intervals will be acceptable.

The riveted-on cuff design of the D412-664-205 aft crosstube is sufficiently strong.



LIQUID PENETRANT TEST REPORT

P- 14947

CLIENT	DART Aerospace	DATE	Aug 18-2009	PAGE	1	OF	1	
ATTENTION	LINDA / CHANTAL	ACUREN JOB NO.	188-09-001497	TIME	AM	<input checked="" type="checkbox"/>	PM	<input type="checkbox"/>
ADDRESS	1270 ABELEEN ST. HAWKESBURY ON. K6H 1K7	PO/VO NO.	10220	WORK LOCATION	HAWKESBURY SHOP			
PROJECT	F.P.I. ON MACHINED PARTS AND CROSS TUBES			ACCEPTANCE STD.	ASTM 1417	REV./DATE	2007	
ITEM(S) EXAMINED	34 ITEMS							

JOB DESCRIPTION	PROCEDURE NO.	LT-6002	REV./DATE	TECHNIQUE NO.	LT-6002	REV./DATE	
PART NO.				MATERIAL	STAINLESS STEEL	THICKNESS	ALUMINE ALUMINUM
SCOPE	WET FLOURESCENT LIQUID PENETRANT INSPECTION CARRIED OUT 100% EXTERNAL						

TEST DETAILS						
METHOD	<input checked="" type="checkbox"/> FLUORESCENT	<input type="checkbox"/> VISIBLE	<input checked="" type="checkbox"/> WATER WASH	<input type="checkbox"/> SOLVENT REMOVABLE	<input type="checkbox"/> POST EMULSIFIED	
FAMILY BRAND	MAGNAFLUX		BLACK LIGHT S/N	16454	<input type="checkbox"/> OUTPUT > 1000 μ W/cm ²	<input type="checkbox"/> AMBIENT < 2 fc
PENETRANT	2LG7	MINIMUM DWELL TIME	45 10	MIN.	LIGHTING EQUIP.	<input type="checkbox"/> FLASHLIGHT <input type="checkbox"/> TROUBLELIGHT <input type="checkbox"/> OUTPUT > 100 fc @ SURFACE
PENETRANT REMOVER	H2O	MINIMUM DRY TIME	> 10	MIN.	OTHER	LAB INO
DEVELOPER	SKD 52	MINIMUM DWELL TIME	10	MIN.	LIGHT METER S/N	CAL DUE DATE
DEVELOPER TYPE	<input checked="" type="checkbox"/> NON AQUEOUS	<input type="checkbox"/> AQUEOUS	<input type="checkbox"/> DRY	DEC. 8-2009		

TEST SURFACE					
SURFACE CONDITION	<input type="checkbox"/> AS GROUND	<input type="checkbox"/> AS WELDED	<input type="checkbox"/> MACHINED	<input type="checkbox"/> SHOT BLASTED	<input type="checkbox"/> CLEAN BARE METAL
SURFACE TEMPERATURE	<input type="checkbox"/> < - 4°C/ 20°F	<input type="checkbox"/> - 4°C/ 20°F TO 10°C/50°F	<input type="checkbox"/> 10°C/50°F TO 52°C/125°F	<input type="checkbox"/> > 52°C/125°F	

RESULTS- (<input type="checkbox"/> METRIC <input type="checkbox"/> IMPERIAL)			
ITEM	COMMENTS	ACCEPT	REJECT
1- CROSS TUBE .W.O. 50803		✓	
1- CROSS TUBE .W.O. 50802		✓	
1- CROSS TUBE .W.O. 51082		✓	
1- CROSS TUBE .W.O. 51081		✓	
1- CROSS TUBE .W.O. 51080		✓	
1- CROSS TUBE .W.O. 50804		✓	
1- CROSS TUBE .W.O. 50981		✓	
1- CROSS TUBE .W.O. 50980		✓	
7- STUDS .W.O. 50931		✓	
16- STUDS .W.O. 50936		✓	
ALL PARTS EXAMINED ON THIS REPORT HAVE BEEN FOUND ACCEPTABLE TO STD. M/ 09 08 19			

Scope of Services
The agreement of Acuren Group Inc. to perform services extends only to those services provided for in writing. Under no circumstances shall such services extend beyond the performance of the requested services. It is expressly understood that all descriptions, comments and expressions of opinion reflect the opinions or observations of Acuren Group Inc. based on information and assumptions supplied by the owner/operator and are not intended nor can they be construed as representations or warranties. Acuren Group Inc. is not assuming any responsibilities of the owner/operator and the owner/operator retains complete responsibility for the engineering, manufacture, repair and use decisions as a result of the data or other information provided by Acuren Group Inc. In no event shall Acuren Group Inc.'s liability in respect of the services referred to herein exceed the amount paid for such services.

Standard of Care
In performing the services provided, Acuren Group Inc. uses the degree, care and skill ordinarily exercised under similar circumstances by others performing such services in the same or similar locality. No other warranty, expressed or implied, is made or intended by Acuren Group Inc.

SIGNATURES			
CLIENT REPRESENTATIVE	MATT MURDOCH	Matt Murdoch	DTR # E-20071
TECHNICIAN (SIGNATURE):	M. Keith Johnston		REPORT REVIEWED BY:
NAME (PRINT):	M. Keith Johnston		NAME INITIALS
CGSB LEVEL	1 ST TECHNICIAN	CGSB LEVEL	2 ND TECHNICIAN
CGSB REG. NO	6066	CGSB REG. NO	